

AMENDMENT AND RESPONSE
Serial Number: 10/726,900
Filing Date: December 3, 2003
Title: MEMBRANE MODULES AND INTEGRATED MEMBRANE CASSETTES

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Case No: 58770US002
(102.0074US01)

CLAIMS

The current claim set of the application is presented below. Indications as to the status of the claims ("original", "currently amended", "cancelled", "new", etc.) appear in parentheses after the claim number. Deletions are identified in bold with single brackets and strikethrough (e.g. ~~[deletion]~~) and new text is identified with underlining (e.g. new language).

What is claimed is:

1. (Currently amended) A membrane module for transferring a constituent to or from a fluid, said module comprising:
 - a) at least two flat sheet membrane elements, each element having an interior portion and an outer surface, wherein the interior portion comprises a plurality of flow channels; and
 - b) at least one primary manifold that is permanently attached to the membrane elements, wherein said primary manifold is in fluid connection with the flow channels of the membrane elements, and
 - c) a space between the membrane elements;

wherein said primary manifold comprises a first fluid flow channel that carries a first fluid to or from the interior portion of the membrane elements in direct fluid communication independent of flow from the interior portions to the outer surfaces of the membrane elements, and

a second fluid flow channel that carries a second fluid to the space between the membrane elements, and wherein said second fluid flow channel is in direct fluid communication with the space between the membrane elements independent of flow between the interior portions to the outer surfaces of the membrane elements.

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2. (Previously Deleted) ~~The membrane module of claim 1, further comprising a space between the membrane elements.~~
3. (Previously Presented) The membrane module of claim 1, wherein said second fluid comprises gas bubbles.
4. (Original) The membrane module of claim 3, wherein said bubbles range in size from about 0.5 mm to about 50 mm.
5. (Original) The membrane module of claim 4, wherein said bubbles range in size from about 1 mm to about 12 mm.
6. (Previously Deleted) ~~The membrane module of claim [2]1, wherein said primary manifold comprises at least one fluid flow channel that carries a fluid to or from the interior portion of the membrane elements.~~
7. (Previously Deleted) ~~The membrane module of claim 6, wherein said primary manifold further comprises a second flow channel that carries a fluid for delivery to the space between the membrane elements.~~
8. (Previously Deleted) ~~The membrane module of claim 7, wherein said fluid comprises a gas.~~
9. (Previously Presented) A membrane module for transferring a constituent to or from a fluid, said module comprising:
 - a) at least two flat sheet membrane elements, each element having an interior portion and an exterior portion;

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- b) at least one primary manifold that is permanently attached to the membrane elements, wherein said primary manifold is in fluid connection with the interior portion of the membrane elements; and
 - c) a space between the membrane elements;
wherein the primary manifold comprises perforations for receiving gas bubbles dispensed from below the membrane module and delivering said bubbles to the space between the membrane elements.
10. (Original) The membrane module of claim 9, wherein the primary manifold further comprises V-shaped or angled channels for collecting fine bubbles dispensed from below the membrane module and combining to form larger bubbles for delivery to the space between the membrane elements.
11. (Previously Presented) The membrane module of claim 3, said module comprising a second primary manifold that is positioned at the opposite end of the membrane elements, wherein said second primary manifold is in fluid connection with the interior portion of the membrane elements.
12. (Original) The membrane module of claim 11, wherein the second primary manifold is adapted to disperse the gas bubbles that are delivered between the membrane elements, thereby preventing said gas bubbles from collecting within said module.
13. (Original) The membrane module of claim 12, wherein the second primary manifold is perforated to allow the gas bubbles to disperse.
14. (Original) The membrane modules of claim 12, wherein the second primary manifold is beveled or angled to allow the gas bubbles to disperse.

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15. (Original) The membrane module of claim 1, wherein said module further comprises a spacer that separates adjacent flat sheet elements.
16. (Original) The membrane module of claim 1, wherein said module further comprises at least one secondary manifold in fluid connection with at least one primary manifold.
17. (Currently Amended) The membrane module of claim 1[6], wherein said module further comprises a secondary manifold in fluid connection with said fluid flow channel of said primary manifold.
18. (Original) The membrane module of claim 1, wherein tension is applied to said membrane elements to aid in maintaining the spacing of said membrane elements.
19. (Original) A membrane cassette comprising at least two of the membrane modules of claim 1.
20. (Original) The membrane cassette of claim 19 further comprising a frame surrounding or supporting said membrane modules.